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A Discussion on Transportation Geography With Map Attached

[This is a translation of an article written by Gunther Kohler, Dresden (deceased) in *Geographische Forschungen* (Geographic Studies), Innsbruck, 1958, pages 115-122.]

A geographic observation of Shensi is particularly intriguing since this province of 193,000 square kilometers¹ includes the Wei Ho Valley, the cradle of Chinese culture; at the same time, it extends to the border in the northern part and, in the south, across Ch'in-ling Shan and, occasionally, even across Ta-pa Shan to the Szechwan basin. Moreover, since Shensi is roughly ten degrees longitude from the Chinese coast, the north is strongly influenced by the climate of Central Asia. The south, on the other hand, borders on the subtropics. Because of its considerable meridional extent, which ranges from 39 degrees 30 minutes to 31 degrees 30 minutes northern latitude, it demonstrates in exemplary manner, on a small scale, the importance of the cohesion of the North and the South of the great Chinese People's Republic.

In physical geographical terms, Shensi includes a part of the loess plateau north of the Wei Ho rift and of the Wei Ho rift area in central Ch'in-ling Shan. Its highest elevation, the T'ai-pai Shan, is 3,550 meters high. To the south it contains part of the upper Han Chiang Valley, as well as the northern slope of the Ta-pa Shan; the ridge of the latter crosses the provincial border, to a significant extent, only to the southeast of Nan-cheng near Ting-yuan.

I have previously presented various surveys of this Chinese province.² Its state of communications has also been mentioned by me³, the last time in the form of a synopsis in *Ostblatt*, "Verkehrsgeographische Übersicht von 4 Eurasien" (Transportation Geography Survey of Eurasia). At present, however, a more detailed transportation geography

study does not exist. The present synopsis is based on my own observations in the 1930's and on the rather scanty writings of the last few years which, while providing data for the transportation geography changes of the new era, do not sufficiently evaluate their significance.⁵ Ferdinand Freiherr von Richthofen, in his classical presentation of the world position of "Hsi-ngan-fu," has also done the most important preparatory work on this subject.⁶

The road map of Shensi Province which I have before me, clearly demonstrates the favorable state of communications in the Wei Ho rift area. In the time of Albert Tafel, Sian was already an important, though not easily accessible, center of communications situated in a well-protected position. To the south, the eastern K'un-lun, the Ch'in-ling Shan, forms a wall-like border; to the north, the boundary is formed by the low Wei Ho rift valley rim. This is readily apparent on all maps: here is the approximate location of the precipitation boundary between 500 and 400 millimeters, as well as the borderlines between average and heavy soil erosion areas, and between densely and sparsely populated areas; eventually, toward the north, there is a drop (Auflockerung) in agricultural activities⁷.

The significance of the Ch'in-ling Shan as an important divide between North and South China is presumably well known; moreover, it is easily recognizable on the above-mentioned special maps. In any case, the wall-like slopes of this mountain range, with its passes at an altitude of 1,250 to 2,250 meters, also constituted an effective barrier to transportation until very recent times. The Wei Ho valley rift has been well delimited to transport in the east and west up to the present.

In the west, the Kansu land ridge, the Liu-p'an Shan, with its Kuan-shan pass at an elevation of 2,400 meters, towers as a transportation barrier. Only the Si-lan / Sian-Lan-chou / highway to Lan-chou is able to overcome the difference in elevation of more than 1,000 meters. A car road, located somewhat more to the south, follows the uppermost loess terrace of the northern bank of the Wei Ho and, together with it, strays ever farther from the Wei Ho, via Wu-kung--Fu-feng--Feng-hsiang to Lung. There, it terminates at the foot of the Liu-p'an Shan.

In the east, cart traffic is held up at the Yellow River. The long ferry trips near T'ung-kuan and north of Han-ch'eng

and at Yu-men-k'ou provide the only connection with the road network of Shansi. The state highway extends from K'ai-feng (Honan); at first, it runs along the Yellow River past the old T'ung-kuan fortress. Then it reaches the capital of the province and terminates on the southern bank of the Wei Ho. Its westward extension ends at Mei Hsien - even before the termination of the last stretch of the car road north of the Wei Ho. This is primarily due to the mountain torrents at the foot of Ch'in-ling Shan; both numerous and very massive bridges are required at this location.

The existing Shensi road map stresses the Wei Ho Valley. This valley is of very great importance to the development of Chinese culture, because of the predominance of the most highly developed native means of transport, i.e., cart traffic. This again affirms that its location has been favored by nature and protected against outside interferences.

In the north, the provincial boundary coincides with the Great Wall, i.e., it extends along the edge of the rather continuous loess covering. Here the ancient Chinese built a protective wall against the border areas of the nomads. Here we find ourselves within the confines of the boundary strip between pasture-steppe and agriculture-steppe climate; thus, we are again at a clear-cut borderline of the distribution and density of the population. The low average annual precipitation of 300 to 400 millimeters falls here on very active, shifting sand-hills; they are therefore characterized by beast-of-burden traffic employing camels, although the mule is also used within and along the Great Wall. The well-defined eastern boundary is formed by the wild canyon course of the Yellow River. Along its course, at Fu-ku to Pao-te and at Wu-pao to Yung-ning on the Shansi side, there are ferry sites that can be easily blocked.

The western boundary of the province shows a pronounced concavity because it detours around the mouth of the Ma-lien Ho, a left-bank tributary of the Ching Ho. In the center, between the sites of the sources of the Ma-lien Ho and the Lo Ho, an area of poor communications is brought into relief; it comprises a loess plateau not yet affected by erosion which lies within a region marked by heavy soil erosion. A much smaller area with poor communications, which is of a similar type, lies south of Pin-hsien on both sides of the traffic-obstructing Ching Ho Gorge. Beast-of-burden traffic is carried on mainly by mules and, in short-

distance traffic, by donkeys. Its range is confined to a loess area which has been strongly affected by soil erosion. The area is very difficult to survey and suffers from a shortage of water. It is therefore not surprising that, with almost identical types of agriculture and with the predominance of sheep- and goat-raising, no effort has been made to establish a basic, rectilinear north-south connection. As I have shown, such a connection was maintained "on foot" in the 1930's between the Wei Ho valley rift and the Wu-pao--Ching-pien line.⁸ But it was maintained only during harvest time. Thus, the cart-traffic area was well protected against unwanted interferences by others, both from the east and from the north. This does not hold true for the west of the Wei Ho valley rift - despite the existence of an area with poor communications to the south of the region of Lung, i.e., the transition strip north of the end of the Wei Ho Gorge at Tai-yin.

At the same time, however, the communication line of the Wei Ho valley rift for the east-west connection is very clearly delineated: K'ai-feng--Cheng-chou--Sian--Lan-chou and further through the Yu-men passage to Central Asia. The other potential east-west connection farther to the north (T'ai-yuan--Wu-pao--Ching-pien--Ting-pien--Ninghsia) did not succeed in establishing itself with native means of transport; this can be ascribed to the physical geographic conditions which we have briefly outlined. Nevertheless, it has now risen to the status of an automobile road, although traffic is subject to brief interruptions during the rainy period. Characteristically, the nearest main artery of communication from east to west lies to the north, outside the confines of our province. It is in a pure steppe area, where there are no sites for reloading. Its course is from Kalgan--Kuei-hua (Huhehot)--Pao-t'ou to Ha-mi--Ku-cheng--Urumchi. It has not been taken into consideration here.

In the 1930's the area of beast-of-burden traffic employing mules showed a minor development of cart roads around the Wu-pai district. The road, however, soon disappears, to the north, west, and south of Sui-te. At Yu-lin, close to the northwestern boundary line, there is again another section of cart road. Beast-of-burden trails and paths prevail between Sui-te and the Wei Ho valley rift, but often only foot paths are encountered. The beast-of-burden trails, which may be said to correspond to first-class roads, give preference to the meridional

course: for instance, Yen-ch'uan--I-ch'uan to Han-ch'eng, close to the Yellow River, running alongside it - or almost parallel to it - in the center of the Province from An-ting via Lu-shih--Fu-hsien and Pai-shui to the coal center of T'ung-kuan, where a railroad connection exists today. In Ordos, the present automobile road from Sian to Yu-lin establishes a connection to Pao-t'ou. But as a north-south thoroughway, it does not measure up to that of Shansi Province in the East. For, in spite of the petroleum deposits that occur there, it is of limited economic importance. In Shansi Province, since 1 January 1958, the Ta-tung--Puchou Railroad has had access to the Lung-hai Railroad. This has been effected by means of a 1070-meter-long railroad bridge across the Yellow River at T'ung-kuan.⁹ As a result, the exchange of goods between Northwest China and the coastal area is being expanded and greatly facilitated.

We have yet to mention the central north-south connection established by the north-south canyon course of the Yellow River. About 1905, at the time of Albert Tafel's travels, the river was still fully utilized for transport despite its dangerous rapids. But before the boats and their freight could reach Sian-fu by water, they had to be carried across the land to the south, above Hu-kou, the nine-meter-high cataract. Both the Sui-yuan railroad in the north, in the 1920's, and the Lung-hai railroad in the south, during the time of my travels, have progressively reduced shipping in the Yellow River canyon. It may be merely a question of time before the poplar wood boats, used as rafts and loaded with coal, will cease to journey to Sian. Similar considerations may be applied to the Wei Ho; the navigable sections of the Wei Ho, as well as its ferry sites, can also be seen on my maps. Toward the east, the Sanmen Gorge peremptorily halts Yellow River shipping. I refrain here from a presentation of the dependence of river traffic on the course of rivers.

Finally, it must be stated with reference to areas of poor transportation facilities that, up to the time of the establishment of the Chinese People's Republic, they were regarded as hideouts for robbers; they have, therefore, been shunned by foreign travelers and have so far not been thoroughly explored.

South of the Ch'in-ling mountain divide, traffic is still carried on by means of beasts of burden, such as mules and donkeys, as well as by human carriers. Two

main communication arteries should be mentioned. The important connection from Sian to Ch'eng-tu leads across the 1,840-meter-high Ta-san-kuan of the Ta-san-ling; this pass is of historic significance, since it provides a passage between the provinces of Shensi and Szechwan. Here Ferdinand von Richthofen traveled for 35 days (from 15 January to 18 February 1872). Starting from Sian, and traveling via Feng-hsiang--Pao-chi--Liu-pa--Pao-ch'eng; to the valley-basin plain of Han-chung, Von Richthofen finally arrived at the provincial capital of Szechwan. But today, nothing remains of the famous pile-built road.¹⁰ Another main traffic artery leads from Sian to Hupeh Province; it runs along the tortuous line that separates the principal Ch'in-ling mountain chain from its eastern extension, the Fu-niu-shan. The route to Lao-ho-kou, the reloading site on the Han Chiang, proceeds via Shang--Shang-nan, along the Tan-chiang and out of the province. The sole west-east connection in the southern district of Shensi Province leads along the Han Chiang Valley. It has attracted increased attention because of the traffic of goods on the Han River, which is navigable even though it abounds with rapids. Otherwise, carrier traffic and limited beast-of-burden traffic prevails in this area, which subsists mainly on forestry. A large area of poor communications begins at the northern base of Ch'in-ling Shan. It is bounded in the west by the sphere of influence (Einflussbereich) of the Shensi-Szechwan, and in the east by the Shensi-Hupeh main highways. It is apparent, first of all, from my population-density map that this area comprises the highest elevation of Ch'in ling shan.

In recapitulating, it may be said that the three districts of the Province - Yu-lin, Kuan-chung, and Han-chung - differ from each other on the basis of their economic features and their density of population. They also differ from the standpoint of transportation geography. Beast-of-burden traffic prevails in the north; cart traffic predominates in the Wei Ho Valley, and carrier traffic prevails in the south. Although river traffic is of minor importance in this province, it has made possible the only direct trade route to the coastal area of Han Chiang that exists up to this day.

This original traffic and its variegated features could be presented more fully. I have already hinted at its physical geography.¹¹ Soil and climatic conditions interrupt travel; this is especially true in the summer during the rainy period. During this period, river traffic is also

blocked because of the high water levels and shifts of the river bed that result from the rain. Spring and autumn are the best times for travel. In particular, the Indian summer which occurs in the period between harvest time and the Chinese New Year, is regarded as the most favorable travel period. Traffic ceases for a protracted period around the time of the Chinese New Year. We may also opportunely mention that travel takes place between sunrise and sunset and that overnight rest is observed for reasons of security, if for no other reason.

The beasts of burden should also be mentioned, and specific reference should be made to the area of their procurement and their care. The supply of animals is, of course, numerically limited, and they are procured from the northern and western border regions of the Province. Road stations have been established to ensure shelter and nourishment to man and beast. This holds true for cart, beast-of-burden, and carrier traffic. It is quite understandable that, for instance, in 1932 during the time of the cholera epidemic in North Shensi, beasts of burden were scarce and were not obtainable in Fu-ku. Animal epidemics have had a similar effect.

The western boundary line for pushcarts lies in the area of cart traffic. Push-cart traffic follows the cart road up to Pin-hsien, but in the west it does not extend beyond the Liu-pan-shan. Neither push-cart traffic nor two-wheel cart traffic extends across Ch'in-ling Shan into the Hanchung district. The width of the track was of importance in cart traffic; consequently, the cart axle had to be changed upon entering the Province. Shortly before the construction of the Lung-hai railroad from Tung-kuan to Sian-fu (1932 to 1934), the ricksha enjoyed its final period of popularity.¹² At the same time, the sedan chair went out of use. In Ch'in-ling Shan, both the sedan chair and the carrying poles were frequently made of bamboo, which were available in this area. In addition to other loads, charcoal, which was burned in the Ch'in-ling Shan area, was transported to Sian-fu in baskets suspended from carrying poles, as well as by means of litters. Thus, viewed in detail, it was a colorful picture!

We have yet to mention the various locations for the reloading of passenger and freight traffic. Sian has always been the center of traffic; this fact is confirmed by the main road network, if by nothing else. The capital

controls the connections in all directions. Kwei chen on the Wei Ho, and especially Hsien-yang, the Wei Ho port for Sian, were once important places of reshipment for land and river traffic. Here, prior to the construction of the Lung-hai railroad, every winter the summer ferry was replaced by a pontoon bridge. As in Kwei-chen/Pao-chi boats, beasts of burden, and carriers meet in Han-chung. We should not omit mention of the eurythermic camel. In the winter, the camel carried salt loads from Ninghsia; it traveled via Tien-shui, the site of reshipment on the upper Wei Ho in Kansu; then it arrived at Han-chung and entered the territory of the Province - although only on the last stretch - quite near the city of the district. The animals were the property of Mongols: they were hired by Chinese Mohammedans for the trip and carried back tea to the semi-arid North Kansu and Ninghsia. Sugar, rice, and tobacco were carried in loads of one and a half centners and found their way to the north. This flow of traffic was, in individual cases, in turn dependent on the political situation within the Province and its border regions, as well as on the harvest yields of individual years. Caravans of mules loaded with medicinal herbs passed through the central district of the Province in order to reach Hopeh.

It is now forever impossible to trace these economically predetermined traffic flows. The railroad, beginning with 1934, has not only relieved the automobile roads developed in the 1930's but has also absorbed the basic traffic in goods. But the population of Sian is now steadily on the rise, and it continues to be the center of traffic. It is situated in the east-west sector of the Lung-hai Railroad and today has a rectilinear connection with the coast (Lien-yun), as well as with the northeast (T'ai-yuan, Peking) via the Ta-tung--Pu-chou Railroad and with the south (Chungking on the Yangtse) via the Pao-chi--Ch'eng-tu Railroad (668 kilometers). In addition, there are other factors that serve to preserve the site of Sian as a center of communications. The importance of the city is further heightened by the air traffic which effects a juncture here. It comes from the west out of Lan-chou, from the south out of Chungking, and has connections to Peking via T'ai-yuan. Thus, at one stroke, the travel time for passengers and freight has been revolutionized! Passage across a distance of 520 li / one li equals about 1/3 of a mile / from Pao-chi via Ch'in-ling Shan used to take seven to eight days, while the 1,500-li trip from Sian to Lan-chou took roughly five days by autobus. But today one travels on the Ch'eng-tu--Peking

express train to the capital in two days and 14 hours,¹³ and the same distance is traversed by plane in a single day.

It is characteristic that railroad traffic -- to the extent that it has not been forced to detour because of land contour (as, for instance, on the stretch from Pao-chi to Ch'eng-tu)-has kept to the old main roads, and that air traffic has also emphasized the most important economic ties. In other words, both have taken advantage of the existing close-meshed supply network of the original means of communications.

As to particulars, many of them may call for more profound examination. Religious-geographic phenomena, although receding into history today, have not been broached at all. Not a word has been devoted in the text to the transmission of news / communications /. My presentation still adheres to the original areas of communication in Shansi Province and demonstrates how the traffic network of modern technology begins to cover these.¹⁴ The extension of such observations to other provinces and eventually, by way of summation, to all of China would provide a foundation for a comprehensive transportation geography of the Chinese People's Republic. A foreign geographer could do this only in cooperation with a sinologist.

Footnotes

1. W. Zill, A New Planimetric Calculation of Shensi Province and its 92 Districts. In: Peterm. Geogr. Mitt. (Petermann's Geographic News), Gotha, 1952, pp 89-92
2. G. Kohler, Karte der Bevölkerungsdichte der Provinz Shensi, 1:1,750,000 (Map of the Population Density of Shensi Province, 1:1,750,000). In: Wissenschaftliche Veröffentlichungen des Deutschen Instituts für Länderkunde (Scientific Publications of the German Geographic Institute), New Series 11, Leipzig, 1952, Appendix 10.
3. By the same author, Verkehrszgeographische Übersicht von Eurasien (Transportation Geography Survey of Eurasia). In: Peterm. Geogr. Mitt., Gotha 1957, pp 260-272. See also: G. Kohler, Das Verkehrsnetz Chinas (The Communications Network of China). In: Wiss. Zeitschrift der Hochschule für Verkehrswesen Dresden (Scientific Journal

- of the Dresden Institute of Higher Education for Communications), V (1957), issue 2: Map.
4. By the same author, Das Weiho-Einzugsgebiet unter Besonderer Berücksichtigung des Verkehrs (The Wei Ho Entrance Region, with Special Consideration of Traffic). In: Peterm. Geogr. Mitt., Gotha 1952, pp 271-275, with one map and 10 pictures.
 5. The listings of roads that can be used by trucks are based on maps of the Chinese People's Atlas, Peking 1951.
 6. Ferdinand Freiherr von Richthofen, China, Second volume, Berlin 1882, pp 681-703.
 7. Regarding the precipitation boundary lines, see: H. V. Wissmann, Begleitworte zu einer Niederschlagskarte von China (Comments on a Precipitation Map of China). In: Zeitschrift Fes. f. Erdkunde, (Journal of the Geographic Society) Berlin 1937, p 38f.
 8. G. Kohler, Besiedlung und Binnenwanderung in Chinas Nordwesten (Colonization and Land Migration in Northwest China). In: Peterm. Geogr. Mitt., Gotha 1954, Table 31.
 9. Hsinhua News Agency of 2 January 1958, No. 3173, p 27.
 10. Recently W. Fuchs presented a summary report on this mountain trail in Mitteilungen des Seminars für Orientalische Sprachen zu Berlin (Reports of the Seminary of Oriental Languages in Berlin), XXVI, Part 1, Ostasiatische Studien (East-Asiatic Studies), Berlin 1933, pp 113-140: From Sian to Ch'eng-tu. I have gratefully welcomed the remnants of a pile-built trail in the Wei Ho Gorge between San-chia and Tai-yin, in 1934, because it made it possible for me to make progress in the Gorge.
 11. See note 3, pp 272-273, 275.
 12. See note 3, p 275
 13. See note 9, p 26 and pp 39-40
 - 14) A surface calculation of the individual traffic districts of Shensi Province produced the following subdivisions:

Compilation

(Values rounded out to 100 square kilometers)

1. Predominantly cart traffic (incl. pushcarts)	19,700 sq. km.
2. Predominantly beast-of-burden traffic employing mules: at short distances, employing donkeys	80,800 "
3. Predominantly beast-of-burden traffic, employing camels and mules	14,900 "
4. Predominantly carrier traffic by natives	59,300 "
5. Districts poor in transportation facilities	<u>19,200 "</u>
	193,900 sq. km.

The strips of beast-of-burden traffic ("employing mules; at short distances, employing donkeys" and "employing camels and mules") have been taken into consideration in the surface calculation, in accordance with the space covered by them on the map. From this, the result is arrived at that the area of cart traffic occupies about 10 percent of the total surface of Shensi Province; the regions poor in transportation facilities are almost of the same size.